

REMARKS

Claims 17, 19, 21, and 23 were objected for misspelling of the word "power". Appropriate corrections have been made.

Claims 1-30 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite.

Claim 1 was rejected under 35 U.S.C. 101 because, in the Examiner's opinion, the claimed recitation of use, without setting forth any steps involved in the process, results in an improper definition of a process.

Furthermore, Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements. In response to the Examiner's rejections, the applicant has redrafted Claim 1 as new Claim 34 that includes the steps involved in the process and that shows essential structural cooperative relationships of elements. All the corrections are made without introducing a new matter.

A summarized explanation given below may be helpful to the Examiner in understanding the principle of my invention:

I. Generation of the helical trajectory of the ions in the register chamber of the proposed TOF mass spectrometer.

Due to the offset position of the ion source and the entrance diaphragm, the ion packet is injected in the periphery of the first quadrupole lens. Therefore, it would have been obvious to a person of ordinary skill in the art that, due to the distribution of the periphery electric field in the quadrupole, the positive ions are shifted towards the negative electrodes of the lens. Because the energy of the ion is high, and ions continue to move in the previous direction, this shift just add a small vector that turns the ion trajectory. If the next coaxial quadrupole had had the lens in the same position relative to the axis of the ion optics, we would have had just the deflection of ions in one plane out of the axis. But in my invention the next lens is angularly shifted relative the previous one, and in the plane of the next quadrupole the next vector shifts the ion trajectory. Because the electric field between these two lenses decelerates the ions, this turn is much stronger. So plurality of the quadrupole lenses generates a helical trajectory instead of straight one and thus drastically increases the time of flight. So the time resolution and the associated mass resolution will be improved due to the longer trajectory.

II. The ion mirror (reflectron) with a superposition of the longitudinal magnetic field as a generator of the space resolution

Each TOF mass spectrometer is provided with the mirror (which in Claim 1 is called electrostatic mirror) that reverses the direction of decelerated ions and at the same time decreases the initial energy spread from the ion source. The coaxial reflectron usually returns ions back along the same trajectory and they impact the ion detector in the vicinity of the inlet diaphragm. In our case it would be the same helical trajectories but in the opposite direction. It would have been obvious to a person of ordinary skill in the art that the longitudinal magnetic field also cause the ion to fly along helical

trajectories with the radii depending on masses of the ions, their velocity, and the magnetic flow. So the superposed magnetic field multiplies the reflected trajectories, and number of these trajectories is equal to the number of ions of different masses. The offset of these trajectories also depends on masses of ions.

So, depending on the mass, the reflected ions will impact the ion-electron emission screen in different points. The detection of the collision time and position of the impacts is possible due to secondary electrons that are registered by the plurality of the ion detectors. These ion detectors are not contaminated by the ions unlike in the regular TOF MS where ion detectors have to be changed very often.

So the proposed mass spectrometer provides high resolution due to:

1. longer path of the ions;
2. difference in the angular and the radial positions of the collision points of the incoming ions.]

All these features are included into my new claims and described in my specification.

Conditional Request For Constructive Assistance

Applicant has made a diligent effort to amend the claims of this application so that they define novel structure which is also unobvious. If, for any reason, the Examiner believes that the claims of this application are not yet in full condition for allowance, applicant respectfully requests his constructive assistance and suggestions pursuant to the spirit of MPEP § 2173.02 and § 707.07(j). This will enable the undersigned to place this application in fully allowable condition as soon as possible and without the need for further proceedings. The Examiner is authorized to make any needed minor corrections or changes.

Very respectfully,

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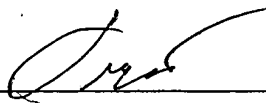
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Yuri Glukhoy